Document ID: TFR-269
Revision ID: 0
Effective Date: 09/30/04

Technical and Functional Requirements

Requirements (Subsystem) for the OU 7-13/14 In Situ Grouting Project

Idaho National Engineering and Environmental Laboratory

Form 412.14
10/9/2003
Rev. 05

CONTENTS

1. INTRODUCTION

1.1 Facility Modification Identification

These technical and functional requirements (T&FRs) support the acquisition of in situ grouting services for the Subsurface Disposal Area (SDA) of the Radioactive Waste Management Complex (RWMC) at the Idaho National Engineering and Environmental Laboratory (INEEL).

1.2 Limitations of the T&FRs

This document collects and documents the requirements derived from the engineering design studies for the OU 7-13/14 In Situ Grouting Project.

1.3 Ownership of the T&FRs

The project engineer assigned to the OU 7-13/14 In Situ Grouting Project owns this document and is responsible for any changes.

2. OVERVIEW

This document collects and documents requirements derived from the engineering design studies for the OU 7-13/14 In Situ Grouting Project. This document was initiated, prepared, reviewed, and approved using MCP-9185, "Technical and Functional Requirements." MCP-9185, Appendix B, "T&FR Outline," was used as a guide and modified as needed to meet project specifics. This document is controlled using MCP-135, "Creating, Modifying, and Canceling Procedures and Other DMCS-Controlled Documents."

2.1 Facility, Structure, System, Component Functions

The systems shall be capable of providing grout and injecting it into the ground at specified locations.

2.2 Facility, Structure, System, Component Classification

The system materials and services shall be procured at procurement quality level 4.

2.3 Operational Overview

Grout is typically pumped into the waste zone using high pressure. Injection tools are inserted into the waste zone in a tightly spaced pattern. Grouting is accomplished with minimal displacement of contaminants and debris or ground heaving. Containers of waste are breached and filled from the inside with grout. This method produces interlocking columns of grout extending from the underburden soil up through the waste, terminating subsurface in the overburden.

The interlocking columns cure into a solid monolith with no discernable edges between columns (*Evaluation of In Situ Grouting for Operable Unit 7-13/14*, INEEL/EXT-01-00278, Rev. 0, December 2002).

3. REQUIREMENTS AND BASES

3.1 Fire Protection Subsystem

National Fire Protection Association (NFPA)-13, "Installation of Sprinkler System," shall be applied to the design. (00100)

Basis – EDF-5054

NFPA-30A, "Automotive and Marine Service Station Code," shall be applied to the design. (00101)

Basis – EDF-5054

NFPA-70, "National Electrical Code," shall be applied to the design. (00102)

Basis – EDF-5054

NFPA-72, "National Fire Alarm Code," shall be applied to the design. (00103)

Basis – EDF-5054

NFPA-101, "Life Safety Code," shall be applied to the design. (00104)

Basis – EDF-5054

NFPA-801, "Standard for Fire Protection for Facilities Handling Radioactive Materials," shall be applied to the design. (00105)

Basis – EDF-5054

Factory Mutual Datasheet 7040, "Heavy Duty Mobile Equipment," shall be applied to the design. (00106)

Basis – EDF-5054

The "International Building Code" shall be applied to the design. (00107)

Basis – EDF-5054

DOE-STD-1088-95, "Fire Protection for Relocatable Structures," shall be applied to the design. (00108)

Basis – EDF-5054

DOE-STD-1066-99, "Fire Protection Design Criteria," shall be applied to the design. (00109)

Basis – EDF-5054

Project facilities and operations shall be provided with a level of fire protection to meet the DOE fire protection objectives. (00198)

Basis – EDF-5054

The fire hazard analysis shall identify and evaluate the fire hazards associated the project. The RWMC facility fire protection engineer is responsible for preparing a fire hazards analysis for the project. (00199)

Basis – EDF-5054

The project shall be designed, constructed, operated, and maintained in a manner that minimizes the occurrence of fires and explosions. (00300)

Basis – EDF-5054

The fire hazard analysis shall determine and list the actions necessary to mitigate the consequences of a fire. (00301)

Basis – EDF-5054

Facilities and equipment shall be designed to use and be constructed of noncombustible or fire-resistant materials, where practical. (00302)

Basis – EDF-5054

The project shall use Underwriters Laboratory (UL)-listed and/or Factory Mutual (FM)-approved materials, appliances, or devices for the intended application, where applicable. (00303)

Basis – EDF-5054

A firewater system is not currently provided in the SDA or around the SDA to supply sprinkler systems or provide firewater for fire department use. (00304)

Basis – EDF-5054

Based on the remote location, use of relocatable structures, and lack of a water supply in the SDA and south of the SDA, it is recommended the facilities be designed so that fire sprinkler systems and fire hydrants are not required. (00305)

Basis – EDF-5054

The size, value, and operation of project facilities may be controlled so that the requirements for fire suppression systems and fire hydrants are not invoked by the DOE orders. (00306)

Basis – EDF-5054

The facilities proposed to support this project are not large enough in area or value or critical to project performance to invoke the highly protected risk criteria to provide a firewater supply. (00307)

Basis – EDF-5054

The high protected risk philosophy will be incorporated through other fire protection features such as the use of noncombustible construction, separation of buildings, and separation from wild land vegetation. (00308)

Basis – EDF-5054

DOE requirements for automatic fire suppression systems and fire hydrants shall be met. (00309)

Basis – EDF-5054

For permanent facilities, DOE requires an automatic fire suppression system for any facility with the following:

- An area of 5,000 square ft or greater
- A fire loss (dollar value) of $1 million or greater
- Critical or long procurement items. (00310)

Basis – EDF-5054

Relocatable structures use these same criteria with the following additions:

- Temporary facilities used as a control center for a vital activity
- In facilities where a fire will affect a vital program for a period of time longer than acceptable as specified by the DOE program senior official
- In a structure where the quantities of hazardous materials exceed the limits delineated in the International Fire Code
- In facilities used for sleeping quarters. (00311)

Basis – EDF-5054

DOE-STD-1088-95, "Standard for Relocatable Structures shall be met, with the following exceptions:

- A limited supply suppression system may be used where a reliable water supply is not available

- Automatic sprinkler systems are not required in fabric or membrane type structures where an acceptable level of protection is provided by alternate means (i.e., a Fire Prevention Program and Fire Department response). (00312)

Basis – EDF-5054

The DOE standard for relocatable structures does not require fire hydrants for relocatable structures that are:

- Required to be mobile or are moved on a regular basis to support an operation

- Under 5,000 square ft or when the fire loss is less than $1 million

- Remote structures as approved by the DOE authority having jurisdiction. (00313)

Basis – EDF-5054

A firewater supply system is not currently installed in the SDA or in the area south of the SDA proposed for this project. The INEEL Fire Department response to emergencies in the SDA includes a 2,000-gal. water tender as a water supply. Extending the existing RWMC firewater system to these areas would be a significant expense. With the proper planning and foresight, facilities and operations for the ISG project can be designed so that automatic fire suppression systems and fire hydrants are not required. (00314)

Basis – EDF-5054

The project design approach is to minimize locating any fixed or relocatable structures in the SDA. This approach is taken in accordance with the company As Low As Reasonably Achievable program and because of the lack of utilities in the SDA. Support facilities are planned to be located on the south side of the SDA. (00315)

Basis – EDF-5054

Facilities at the INEEL are designed in accordance with the International Building Code, DOE orders, NFPA Standards, and the INEEL Architectural and Engineering Standards. DOE-STD-1088-95 provides additional design criteria for

relocatable structures, including mobile homes, trailers, semi-trailers, and tent or membrane structures. (00316)

Basis – EDF-5054

The following fire protection requirements are applicable to this project and the proposed facilities:

- Membrane-type structures should be constructed of tent material that is either noncombustible or flame-resistant, as tested (large scale) and approved for the anticipated use. The use of noncombustible materials is preferred.

- A means to notify the fire department of an emergency will be required. For remotely located facilities, notification by telephone is an accepted method.

- A means to notify and evacuate building occupants in the event of a fire is required by DOE orders. For facilities the size and occupancy proposed by this project, the International Building Code and the Life Safety Code (i.e., NFPA 101) do not require a fire alarm system to notify the occupants of a fire. Building occupant notification would be performed by local occupant voice announcement.

- Portable fire extinguishers will be required in all facilities and equipment in accordance with NFPA 10, "Portable Fire Extinguishers."

- Interior finishes will be UL-listed with a flame spread rating under 25 and smoke developed rating of less than 50.

- The underside of the trailers will be lined with 18-gauge sheet metal or noncombustible materials to minimize the accumulation of combustible debris. (00317)

Basis – EDF-5054

The drill rig will be a roto-hammer drill mast attached to the boom of a diesel-powered trackhoe. A trackhoe is a mobile piece of heavy construction equipment that will be operating in the SDA. This equipment will be operated and stored outdoors. During the off-season, the trackhoe will be moved out of the SDA and stored outside. (00318)

Basis – EDF-5054

The trackhoe is commercially available equipment that is used in general industry. The drill mast is commercially available, but will be customized to support the

special requirements for this project. This modified equipment is specific to the project performance and may not be readily replaceable. (00319)

Basis – EDF-5054

FM Datasheet 7-40 identifies criteria to reduce fire losses associated with heavy mobile equipment, such as the trackhoe. This datasheet specifies the following requirements:

- A fixed automatically actuated multipurpose dry chemical extinguishing system will protect the engine compartment.
- Where practical, the hydraulic fluid will be an FM-approved less-flammable fluid.
- If a FM-approved less-flammable hydraulic fluid is not used, a pre-engineered fixed automatically actuated multipurpose dry chemical extinguishing system shall protect areas where ignition of hydraulic fluid is possible.
- A means to manually activate the system will be provided in the operator's compartment and at an outside location that is accessible from the ground. The system shall be interlocked to shutdown the engine and hydraulic system when the suppression system activates.
- At least one 20-lb multipurpose dry chemical fire extinguisher shall be provided on each vehicle. (00320)

Basis – EDF-5054

The incorporation of the fire protection requirements needs to be evaluated through a fire hazard analysis. (00321)

Basis – EDF-5054

The trucks used to transport grout from the batch plant to the grout injection site will be concrete mixer trucks. These trucks are commercially available, and no specialty features are necessary to support this project. A replacement truck should be readily available to maintain the project schedule if one is damaged. Each truck should contain a fire extinguisher, but no automatic suppression systems are required. (00322)

Basis – EDF-5054

The grout batch plant will be an unenclosed outdoor operation. The grout supply system will consist of silos, mixers, possible delivery trucks or train cars, low-

and high-pressure pumps, and distribution lines. No fire protection design issues are anticipated for the grout batch plant. (00323)

Basis – EDF-5054

3.2 Grout Delivery Subsystem

The shaker screen shall be an oil field mud type designed and constructed to fit the receiving hopper, or the receiving hopper shall be designed to fit the screen. (00110)

Basis – EDF-5102

The grout receiving hopper shall receive grout from the ready-mix trucks and have an integral low pressure pump. (00111)

Basis – EDF-5102

The low pressure pump, which is integral with the receiving hopper, shall be capable of providing flow through the low-pressure piping and duplex strainer to the high-pressure pump inlet at the high-pressure pump manufacturer's recommended pressure (50 pounds per square inch minimum). (00112)

Basis – EDF-5102

The high-pressure pump shall be a triplex diesel-powered positive-displacement pump capable of delivering 50 gallons per minute (191 liters per minute) at 8,000 pounds per square inch (552 bar) measured at the pump outlet. (00113)

Basis – EDF-5102

The high-pressure retaining components (valves, flow line piping, hammer unions, integral union connections, manifolds, steel hose loops, and swivel joints) shall be designed and tested for a non-shock cold working pressure of 10,000 pounds per square inch. (00114)

Basis – EDF-5102

High-pressure relief devices shall provide system pressure relief capability that will ensure that pressure does not exceed American Society of Mechanical Engineers design codes of 10,000 psig maximum allowable working pressure. (00115)

Basis – EDF-5102

High-pressure grout hoses and fittings from discharge of the grout injection pump up to and including the swivel shall be new, not previously use parts. (00116)

Basis – EDF-5102

Whip socks (Chinese fingers) with clevises shall be provided at all hose connections to prevent a whipping hose in case of hose connection failure. (00117)

Basis – EDF-5102

Equipment guards shall be required at any connection or fitting that does not meet American Petroleum Institute (API) design codes to prevent personnel injury should the connection or fitting fail. (00118)

Basis – EDF-5102

The drill pipe shall be new, approximately 3.5-inch outside diameter, with a minimum yield strength and wall thickness as required of 13,800 pounds per square inch internal pressure with integral welded tool joints. (00119)

Basis – EDF-5102 and API RP-7G, "Recommended Practice for Drill Stem Design and Operating Limits," Table 3

Drill stem subassemblies (drill pipe tool joints, drill stem subassemblies, and drill stem swivels) shall be designed to be able to drill to a depth of 25 feet from the ground surface. (00120)

Basis – EDF-5102

The drill bits shall be hollow tapered point with an API threaded joint and with two jets (180 degrees apart) or three jets (120 degrees apart) that are separated vertically. (00121)

Basis – EDF-5102

3.3 Grout Injection Subsystem

Equipment shall include an integrated hydraulic excavator with a rotary percussion drill head-end effector, high-pressure pump system integrated with the injection system, hose management systems, monitoring and control systems, and all accompanying documentation. (00122)

Basis – EDF-4933, -5102, -5153, and -5155

Equipment that must operate on SDA surfaces should have ground pressures of 2,000 pounds per square foot or lower. (00123)

Basis – EDF-5147

The system and operations shall meet Occupational Safety and Health Administration standards. (00124)

Basis – EDF-5152 and -5155

Fire protection shall be in accordance with Factory Mutual Datasheet 7-40, "Heavy Duty Mobile Equipment." (00125)

Basis – EDF-5054

3.4 Grout Selection System

Testing of the in-place hardened grout–waste–soil mixture in the SDA will not be practical because of concerns with contamination release and safety. (00126)

Basis – EDF-5146

Some of the tests recommended for grout during production are temperature, unit weight, and air content. (00127)

Basis – EDF-5146

The grouts must have the viscosity, particle size, and set times required for grouting operations. (00128)

Basis – EDF-5146

Normal Portland cement-based jet grouts are mixtures of cement and water. (00129)

Basis – EDF-5146

3.5 Grout Storage and Mixing Subsystem

Unloading pits shall be designed and constructed in accordance with American Concrete Institute (ACI) 318-02, "Building Code Requirements for Structural Concrete." (00130)

Basis – EDF-5135

All conveyors (screw, bucket, or belt) shall be equipped with machine guards, brakes, control stations, emergency stop buttons, and safety features as specified

in American Society of Mechanical Engineers (ASME) B20.1, "Safety Standard for Conveyors and Related Equipment." (00131)

Basis – EDF-5135

Grout mixing plant skids and agitator tank are to be designed to the vendor's standards. (00132)

Basis – EDF-5135

The truck unloader pit for sand shall be designed and constructed large enough to allow for unloading equipment such as the hopper adapter and conveyor feeder. (00133)

Basis – EDF-5135

3.6 Foundation Grouting Subsystem

The safety category for this analysis is consumer grade. (00134)

Basis – EDF-5028

The analysis considered the effect of the design basis seismic event corresponding to a performance category 2. (00135)

Basis – EDF-5028

The combination of gravity and applicable seismic loads are considered in the analysis. (00136)

Basis – EDF-5028

The analytical approach used to evaluate potential spacings for grouted columns in the pits and trenches included the use of the computer program PLAXIS. (00137)

Basis – EDF-5028

3.7 Measurement and Instrumentation Subsystem

The overriding concern and emphasis imposed by management upon the designers of the measurement and control system is to conceive of and proceed with a design that is as practical and simple as possible, while not necessarily avoiding state-of-the-art electronic equipment. (00139)

Basis – EDF-4933

Another prime consideration is that there must be redundancy in the system, to the extent that even a failure of the supervisory control and data acquisition system would not shut down the in situ grouting operation. (00140)

Basis – EDF-4933

Provide for high-pressure pump continuous monitoring. (00181)

Basis – Desired Feature

Provide for video camera attached to track hoe drill. (00182)

Basis – Desired Feature

Be able to position the drill bit to within less than (initial target of 1 inch) from the target position. (00183)

Basis – Desired Feature

Be able to position the drill bit within (initial target of 2 minutes) of changing positions. (00184)

Basis – Desired Feature

Provide for depth feedback. (00185)

Basis – Desired Feature

Be able to measure plumbness. (00186)

Basis – Desired Feature

Be able to measure grout pressure. (00187)

Basis – Desired Feature

Be able to measure grout flow. (00188)

Basis – Desired Feature

Be able to measure grout set time. (00189)

Basis – Desired Feature

Be able to measure drill string position. (00190)

Basis – Desired Feature

3.8 Electrical Support Subsystem

Monitoring instrumentation and recording equipment shall be reliable enough to provide continuous monitoring of all critical data. (00141)

Basis – EDF-5122

NFPA-70, "National Electrical Code," shall be applied to the design. (00142)

Basis – EDF-5122

NFPA-70E, "Electrical Safety Requirements for Employee Work Places," shall be applied to the design. (00143)

Basis – EDF-5122

120 volt alternating current will be provided for air conditioning and other accessories for the comfort of the operator and reliable operation of sensitive electronic equipment. (00144)

Basis – EDF-5122

3.9 Facility Support Subsystem

A gantry crane and jib crane with capacities of 20 tons and 2 tons, respectively, shall be provided in the proposed new maintenance and storage facility. (00145)

Basis – EDF-5144

The reinforced concrete floor slab of the proposed new maintenance and storage facility shall be designed to support approximately 1,500 pounds per square foot. (00146)

Basis – EDF-5144

Snow load design shall meet the requirements of the International Building Code. (00147)

Basis – EDF-5144

Wind load design shall meet 90 mile per hour wind speed per the International Building Code. (00148)

Basis – EDF-5144

3.10 Mechanical Support Subsystem

Water supply piping shall be sized for a maximum fluid velocity of 5 feet per second. (00149)

Basis – EDF-5150

Low-pressure water systems shall have a maximum design pressure of 150 pounds per square inch gauge. (00150)

Basis – EDF-5150

A water supply source and the supply system shall be sized to deliver approximately 50 gallons per minute maximum flow during grouting operations. (00151)

Basis – EDF-5150

The water supply pump shall have a backup pump to prevent unavailability of the water supply system. (00152)

Basis – EDF-5150

3.11 Vehicle Support Subsystem

Equipment that must operate on SDA surfaces should have ground pressures of 2,000 pounds per square foot or lower. (00153)

Basis – EDF-5162

Systems and operations shall meet Occupational Safety and Health Administration standards. (00154)

Basis – EDF-5162

All systems and components shall be commercial grade. (00155)

Basis – EDF-5162

Each vehicle shall carry an approved fire extinguisher. (00156)

Basis – EDF-5162

3.12 Environmental and Safety Subsystem

Radiological decontamination of equipment, materials, and sample containers will be a regular part of the drilling operations. (00157)

Basis – EDF-5152

Radiological contamination control procedures will be implemented throughout the in situ grouting project to minimize personnel contact with contaminated surfaces. (00158)

Basis – EDF-5152

Radiological decontamination procedures for personnel and equipment will be necessary to control radiological and hazardous constituents contamination and protect personnel if it is encountered. (00159)

Basis – EDF-5152

Both hazardous constituents and radiological contamination on surfaces will be decontaminated. (00160)

Basis – EDF-5152

3.13 Operations, Maintenance, and Logistics Subsystem

Although specific API specification requirements have not been previously applied to high-pressure grouting equipment at the INEEL, the use of pressure-retaining components complying to the API specifications will ensure the components are designed, manufactured, and hydrostatically tested for the 10,000 pounds per square inch maximum rated working pressure, one of the pressure classes listed in API specification 6A, “Specification for Wellhead and Christmas Tree Equipment,” paragraph 4.2.1. (00161)

Basis – EDF-5155

If the high-pressure components do not meet API standards, the components must comply with the design methodology in the ASME Boiler and Pressure Code, Section VIII, Division 2, and Appendix 4. (00162)

Basis – EDF-5155

The procurement specification shall require the subcontractor to properly design and subsequently disclose the design of the components and equipment. (00163)

Basis – EDF-5155

The procurement specification shall require the subcontractor to design the pressure system with parts compliant to the rated system pressure. (00164)

Basis – EDF-5155

Pressure system operating instructions shall be written compliant with the requirements found in PRD-320, "Pressure System Safety." (00165)

Basis – EDF-5155

The high-pressure system will be designed to allow for both a static (leak) test and dynamic test. (00166)

Basis – EDF-5155

3.14 SDA Site Conditions Subsystem

If modifications to the drainage system become necessary, the modifications shall be designed based on a maximum 25-year, 6-hour storm cycle of 1.4 inches, as required by the Department of Energy, Idaho Operations Office, Architectural Engineering Standards. (00167)

Basis – EDF-5147

If modifications to existing roadways are necessary, they will be designed using American Association of State Highway and Transportation Officials Standards. (00168)

Basis – EDF-5147

A stormwater protection plan shall be required to ensure that rain and snow will be properly routed from the subsurface disposal area during grouting. (00169)

Basis – EDF-5147

The existing roads shall be maintained during grouting. (00170)

Basis – EDF-5147

The grouting operations must coordinate access requirements with other SDA activities, such as waste retrieval and disposal. (00171)

Basis – EDF-5147

3.15 Project Requirements

Be able to be certified for 10,000 pounds per square inch working pressure for the high-pressure grout pump and associated piping spool pieces, instrument housing, hoses, drill stem swivel, and drill stem. Submit pressure design report. (00178)

Provide high-pressure pump. (00179)

Provide for high-pressure pump continuous monitoring. (00180)

Provide grout storage tank. (00191)

Be able to interface with hose management components. (00192)

Provide method for delivering grout via ready-mix style truck from agitator tank to grout receiving hopper. (00193)

Be able to predict high-pressure hose change before failure and inspect hose exterior daily. Be able to handle corrective action, an administrative requirement. (00194)

High-pressure components shall testable (hydrostatically) after component change if any high-pressure retaining connections have been broken. (00195)

Minimum hose bend radios shall be defined. (00196)

The maintenance requirement shall be defined for disconnecting and inspecting high-pressure hose-end interiors. (00197)

Field welding and examination of all pressure piping and pipe supports shall be performed in accordance with the INEEL Welding Manual. (00340)

Welding procedures and welding qualifications for onsite welding shall be in accordance with INEEL Welding Manual. (00341)

Welding qualification for personnel performing onsite welding and a letter listing the onsite welding procedures to be used shall be submitted for contractor approval. (00342)

Subcontractor records shall be legible, identifiable, retrievable, and protected from damage, deterioration, or loss. (00343)

Subcontractor records shall be signed and dated. (00344)

Individual components and assemblies shall be assigned and marked with unique code to maintain traceability and associated records. (00345)

Subcontractor shall verify that the system pressure relief equipment functions as designed. (00346)

High-pressure grout hoses shall be inspected in accordance with manufacturer's recommendations. (00347)

Destructive testing shall be performed on removed (failed) high-pressure grout hoses to determine interior hose condition and end fitting wall thickness thinning. (00348)

High-pressure components shall be inspected in accordance with manufacturer's recommendations. (00349)

Quarterly visual inspections shall include inspection for exterior damage and inspection of interior sealing surfaces for fittings that are readily accessible. (00350)

Field repair shall not be performed on high-pressure retaining piping components. (00351)

Repair or remanufacturing of piping components shall only be performed by the component manufacturer. (00352)

Pumps, swivels, and drill string components shall be field repaired in accordance with vendor instructions .(00353)

Field replacement of any pressure-retaining component may be performed by the subcontractor. (00354)

Drill stem elements shall receive quarterly visual inspections for cracks in the outside of the drill stem in accordance with API RP 7G Section 13.2.2. (00355)

Subcontractor shall submit product data and catalog cuts for all materials as vendor data. (00356)

Operating manuals for safety valves, valves, and equipment shall be submitted as vendor data. (00357)

Leak test procedure(s) submitted by the contractor shall include the requirements that all air be vented. (00358)

Storage for raw grout products shall be provided. (00359)

Capability to transfer raw grout materials from delivery vehicles to the storage area shall be provided. (00360)

Storage for mixed grout product shall be provided. (00361)

Mixing capability to meet grout specifications shall be provided. (00362)

Capability to measure grout compression shall be provided. (00363)

Grout batch plant shall be provided. (00364)

Capability for delivery of mixed grout product shall be provided. (00365)

Flexibility to handle changes to grout recipe shall be provided. (00366)

Capability to unload sand and a powder commodity simultaneously shall be provided. (00367)

Capability to transfer grout mixture to the grout high-pressure delivery system shall be provided. (00368)

Capability to use the cleanup water in the grout mix shall be provided. (00369)

Subcontractor shall supply Portland-based cement for waste matrix grout. (00370)

Subcontractor shall supply Portland-based cement for foundation grout. (00371)

4. REFERENCES

ACI 318-02, "Building Code Requirements for Structural Concrete."

American Association of State Highway and Transportation Officials Standards

American Petroleum Institute design codes

American Society of Mechanical Engineers design codes

API specification 6A, "Specification for Wellhead and Christmas Tree Equipment" paragraph 4.2.1

API RP-7G, "Recommended Practice for Drill Stem Design and Operating Limits," Table 3

ASME B20.1, "Safety Standard for Conveyors and Related Equipment"

ASME Boiler and Pressure Code, Section VIII, Division 2, and Appendix 4

DOE-STD-1066-99, "Fire Protection Design Criteria"

DOE-STD-1088-95, "Fire Protection for Relocatable Structures"

EDF-4933, "OU 7-13/14 In Situ Grouting Project Measurement and Control"

EDF-5028, "OU 7-13/14 In Situ Grouting Project Foundation Grouting Study"

EDF-5054, "OU 7-13/14 In Situ Grouting Project Fire Protection"

EDF-5102, "OU 7-13/14 In Situ Grouting Project Grout Delivery System"

EDF-5122, "OU 7-13/14 In Situ Grouting Project Electrical Utilities"

EDF-5135, "OU 7-13/14 In Situ Grouting Project Grout Storage and Mixing"

EDF-5144, "OU 7-13/14 In Situ Grouting Project Support Facilities"

EDF-5146, "OU 7-13/14 In Situ Grouting Project Grout Selection Basis"

EDF-5147, "OU 7-13/14 In Situ Grouting Project Subsurface Disposal Area Site Conditions"

EDF-5150, "OU 7-13/14 In Situ Grouting Project Support Systems"

EDF-5152, "OU 7-13/14 In Situ Grouting Project Environmental, Safety, and Health"

EDF-5153, "OU 7-13/14 In Situ Grouting Project Hydraulic Excavator and Drill-Injection Rig"

EDF-5155, "OU 7-13/14 In Situ Grouting Project Operations, Maintenance, and Logistics"

EDF-5162, "OU 7-13/14 In Situ Grouting Project Support Vehicles"

Factory Mutual Datasheet 7040, "Heavy Duty Mobile Equipment"

International Building Code

INEEL Architectural Engineering Standards

INEEL/EXT-01-00278, *Evaluation of In Situ Grouting for Operable Unit 7-13/14*, Rev. 0, December 2002

INEEL Welding Manual

MCP-135, "Creating, Modifying, and Canceling Procedures and Other DMCS-Controlled Documents"

MCP-9185, "Technical and Functional Requirements"

NFPA-13, "Installation of Sprinkler System"

NFPA-30A, "Automotive and Marine Service Station Code"

NFPA-70, "National Electrical Code"

NFPA-70E, "Electrical Safety Requirements for Employee Work Places"

NFPA-72, "National Fire Alarm Code"

NFPA-101, "Life Safety Code"

NFPA-801, "Standard for Fire Protection for Facilities Handling Radioactive Materials"

PRD-320, "Pressure System Safety"

Appendix A

Other Requirements to Consider

Waste matrix grouted monoliths shall minimize gas generation and permeability. (00009)

Foundation grouted columns shall minimize gas generation. (00012)

Contaminant grouting scope shall be based on a graded risk-based approach. This approach will take into account the long-term risk posed by individual contaminants of concern with the intent of focusing grouting operations on waste areas that have more significant risk considerations. (00026)

The capability shall exist to sample the grout material before it is injected. (00040)

All data (process and samples) needed to assure performance shall be verified before grout is injected. (00052)

All components shall be maintained in stable and known condition from the annual layup period until the next year startup. (00042)

All components shall be maintained in a stable and known condition from after shutdown until the post shutdown layup period. (00043)